LOCAL ANALYSIS & PREDICTION SYSTEM (LAPS): A LOOK INTO THE FUTURE

Zoltan Toth

Global Systems Division, ESRL/OAR/NOAA

Acknowledgements:

Steve Koch, John McGinley, members of Forecast Applications Branch

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WORKSHOP OBJECTIVES

Critical review around 20-year mark for LAPS

Provide guidance on LAPS development, including

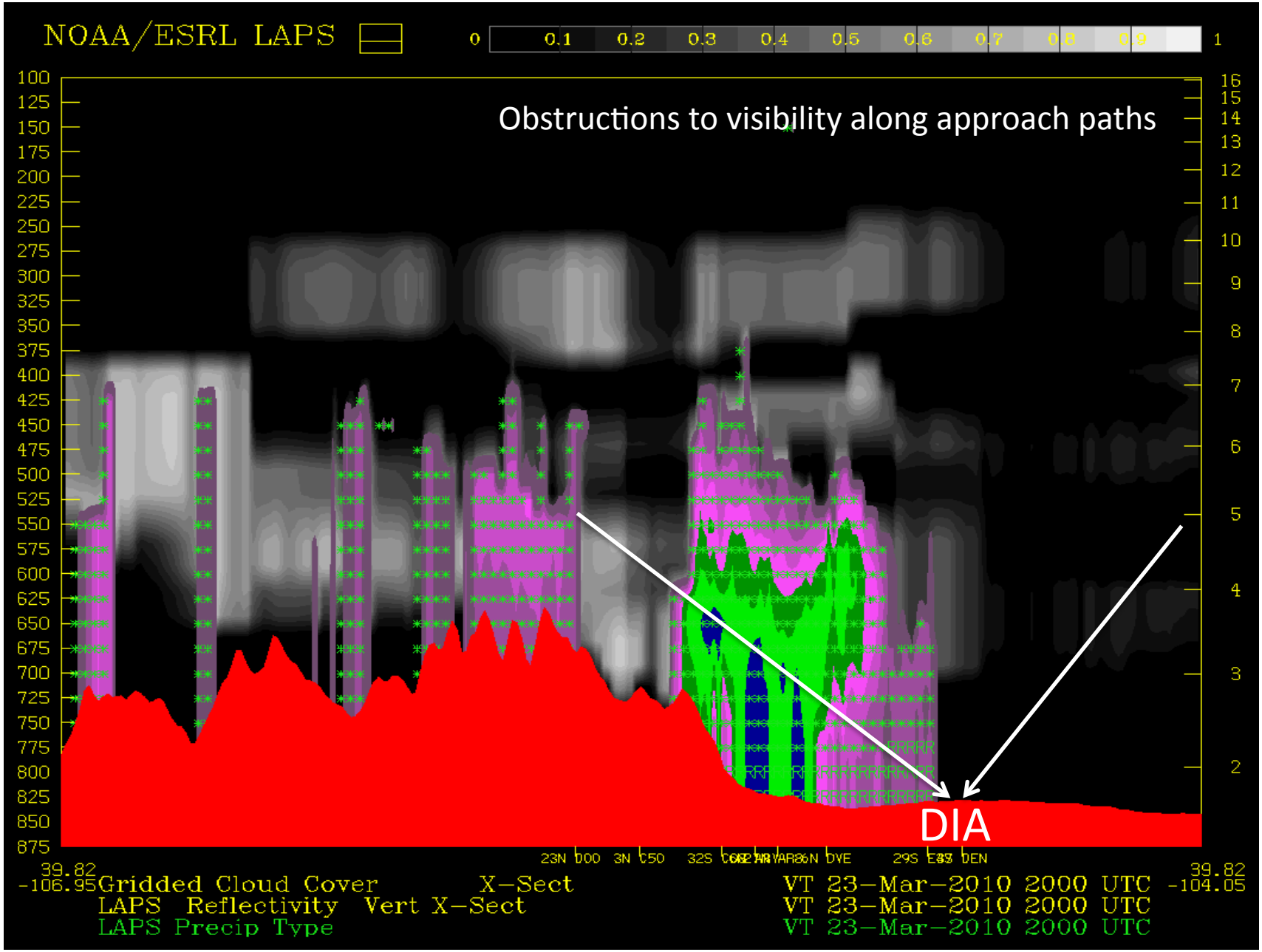
- Scientific foundation / gaps
- Use in operations
- LAPS in NOAA and the national/international weather enterprise
- New directions

Focus on future outlook for each item
Identify & discuss open questions

SUMMARY OF LAPS ACCOMPLISHMENTS

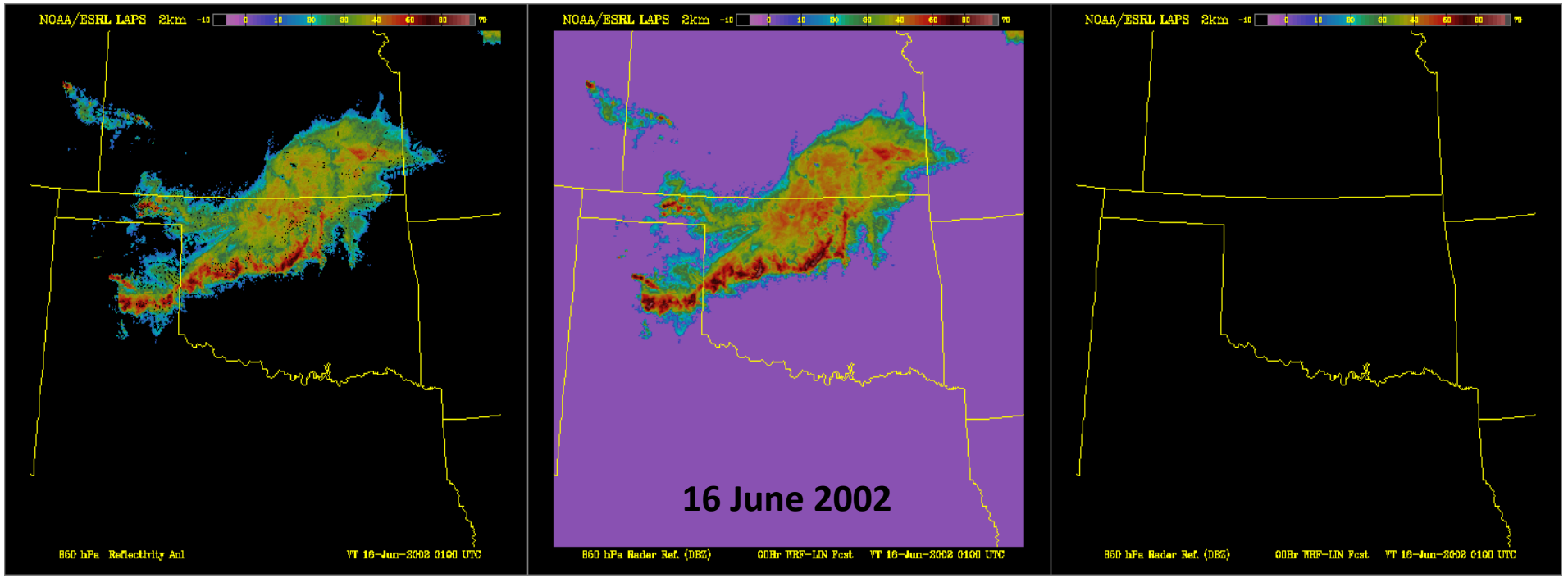
- **First** comprehensive cloud initialization scheme
  - Achieved in early 1990s
- Very **efficient,** very **rapid update, fine scale**
  - 5-15 mins cycles, 1 km resolution
- **Highly portable** analysis system
  - Pre-WRF achievement
  - Runs on variety of platforms
- LAPS or its adaptations **operational** at
  - 15+ agencies
    - Including 6 weather services worldwide
- Plethora of **scientific achievements**
  - Large number of publications worldwide

Cloud / Reflectivity / Precip Type (1km analysis)



850 mb Analyzed and Simulated Reflectivity

Analysis | 2hr HOT Fcst | 2hr NO-HOT Fcst



Initialized with LAPS | Initialized with NAM

Mature Squall Line Animation

OAR/ESRL/GSD/Forecast Applications Branch
http://esrl.noaa.gov/gsd/fab

LAPS TEAM

- **Data assimilation**
  - Steve Albers, Yuanfu Xie
- Satellite and other **observations**
  - Dan Birkenheuer, Seth Gutman, Kirk Holub, Tomoko Koyama
- **Physical processes**
  - Paul Schultz
- **Ensemble forecasting**
  - Isidora Jankov
- **Evaluation and verification**
  - Ed Tollerud, Ed Szoke
- **Software engineering**
  - Linda Wharton, Paul McCaslin
- **Technical support**
  - Adrienne Rose, Joanne Krumel, Stanislav Stoichev
- **Former colleagues**
  - John McGinley, Huiling Yuan, Brad Beechler, Brent Shaw, etc
- Long list of **collaborators, visitors**, etc

SCIENTIFIC SOUNDNESS

- **Solid foundation** for traditional LAPS analysis

- **Weak overall structure**
  - Not 3- or 4-Dvar arrangement

- **Room for significant improvement**
  - New 3Dvar scheme is being developed
    - Traditional “hot-start” rebuilt using variational principles
  - Space-Time Multi-scale Analysis System (STMAS)
    - More information extracted from data
    - More balanced initial fields
    - Already used by US & international agencies!

USE IN OPERATIONS

- **Quality**
  - The good and the bad – need honest feedback
- **Ease of use**
  - AWIPS and elsewhere
- **Choice of domain** and execution – *Information Technology (IT) issue*
  - Local / Regional
    - NWS – Local Weather Forecast Offices (WFOs) and Eastern Region
  - Central
    - Korean Meteorological Agency
    - Central Weather Bureau (Taiwan)
    - Finnish Meteorological Institute
- **Link with other tools**
  - MADIS, NNEW, WRF, etc

LAPS IN NOAA & WEATHER ENTERPRISE

- Same methodology pioneered for fine scale local applications
  - Can be tested & transitioned to **CONUS, national, or global scales**
  - *Scientifically*, choice of execution (IT issue) does not matter

- **Potential use in NCEP operations** (Rapid Refresh, etc)
  - Ideally, same/similar algorithms should be considered for various scales
  - Methods tested successfully on fine scale may find their way into next generation national / global systems

- **What is needed for successful technology transfer** to NCEP Central Operations?
  - Local execution may require specific information technology solutions
  - Fine scale solutions may warrant deviations from GSI approach on specific issues
  - Build/retain consistency with system operational at NCEP (GSI) in all other areas
  - Very challenging task

NEW DIRECTIONS

- **Data assimilation**
  - 3- and 4-Dvar
    - Collaboration with WRF and DTC DA activities
  - Global LAPS
    - Encouraging results re tropical and warm season convective systems
- **Ensemble forecasting**
  - Major expansion into probabilistic forecasting
  - Coupled Data assimilation / ensemble forecasting system
    - Ensemble-based covariances for 3-4-Dvar
- **Finer resolution** applications
  - Convective initiation
    - Warn-On-Forecast
  - Fire weather & Renewable Energy
    - 100s or 10s of meters resolution
- **Field deployment**
  - Support incident meteorology
  - Real time assimilation of field observations
- **Statistical post-processing**
  - To remove systematic errors from ensemble

WORKSHOP EXPECTATIONS

Provide advice and feedback to facilitate

- Adjustments / corrections in approach
- Making system more useful for customers
- New initiatives to better serve community

Thank you all for coming!

BACKGROUND